

A Hospital-Based Assessment of the Clinical and Laboratory Profile of Typhoid Fever in Infants and Children: An Observational Study

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Abstract

Aim: The aim of the present study was to assess the clinical and laboratory profile of typhoid fever in infants and children with possible gender differentiation.

Methods: The present study was a hospital-based, prospective and a cross-sectional study that was carried out at Department of Pediatrics, SKMCH, Muzaffarpur Bihar, India for one year on 100 subjects that were selected using purposive sampling technique

Results: Most of the patients were in the age group of 5-15 years (68%) followed by 1-5 years (26%). The signs and symptoms of typhoid fever were analyzed according to age. Headache, anorexia and irritability were statistically significant symptoms for typhoid fever ($p < 0.05$). The most frequently observed signs were abdominal distention, splenomegaly and hepatomegaly. Coated tongue was found only in the age group 5-15. Rose spots were not observed in any of the cases. On the analysis of the signs according to age, there were no significant differences in the frequency of any signs in the three age groups. Relative bradycardia was present in 4 cases in the age group 5-15 and absent in other age groups. Anemia was found in 55 (55%) patients. Mean hemoglobin percentage of all cases involved in the study was 10.5% with SD of 1.7.

Conclusion: Typhoid fever is still a serious public health concern that mostly affects school-age children. Public health measures include the provision of clean water for drinking, proper sanitation, education on the illness and how it spreads, and excellent hygiene habits may be used.

Keywords: Fever, Infants, Typhoid fever, clinical and laboratory profile.

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Introduction

A systemic infection caused by the *Salmonella enterica* serotype typhi bacteria results in typhoid fever. This very well-adapted disease, which only affects humans, has developed exceptional mechanisms for persistence in its host, which support its survival and propagation. In these areas, the prevalence of typhoid was drastically reduced as a

result of the availability of clean water and effective sewage systems. Today, the developing world, where sanitary standards are still subpar, bears a disproportionately heavy weight of the illness. Since many hospitals lack capabilities for blood culture and up to 90% of patients with typhoid are treated as outpatients, it is challenging to gather

reliable data from which to estimate the incidence of illness in these locations. Public health statistics persistently understate the prevalence of typhoid, according to community-based studies. Recent reports have indicated annual incidence rates of 198 per 100,000 in the Mekong Delta area of Vietnam and 980 per 100,000 in Delhi, India. [1,2]

Enteric fever is a multi-systemic tropical infectious disease. Causative organisms are *Salmonella enterica* serotype Typhi (*S. typhi*) or *Salmonella enterica* serotype Paratyphi A, B, or C. It is prevalent in most underdeveloped countries, with India having a high disease burden of 214.2 per 100,000 individuals per year. [3] Endemicity in developing countries is attributed to the low standard of living, poor hygiene practices, poor sanitation, contaminated water sources, and lack of universal vaccination. In children, the common age group affected is between five to 19 years, but in some endemic areas of Asia, it is also common in children less than two years. [4] Clinical manifestations are non-specific, which may delay the diagnosis and treatment leading to fatal complications. Presenting complaints vary from mild constitutional symptoms to severe complications involving multiple organs. Clinical suspicion is pivotal for diagnosis. Common presentations are fever, vomiting, diarrhoea, abdominal pain, cough, headache, and lethargy. The gold standard for diagnosis is blood culture, but in 70% the culture is negative due to injudicious use of antibiotics before admission. [5]

Assessment of a child presenting with fever is always a challenge to most pediatricians. Typhoid fever is one of the common causes of fever in children with varied presentation and significant difference in the signs and symptoms compared to adults. Population based studies from South Asia indicate that age specific incidence of typhoid fever is highest in children under 5 years of age, in

association with comparatively higher rates of complications and hospitalization. The gold standard of the diagnosis of typhoid fever is a positive result of culture from the blood, urine or stool. [6] The classic Widal agglutination test is one of the most utilized diagnostic tests for typhoid fever, especially in developing countries. [7]

The aim of the present study was to assess the clinical and laboratory profile of typhoid fever in infants and children with possible gender differentiation.

Materials and Methods

The present study was a hospital-based, prospective and a cross-sectional study that was carried out at Department of Pediatrics, SKMCH, Muzaffarpur Bihar, India for one year on 100 subjects that were selected using purposive sampling technique.

The inclusion criteria considered were the infants and children with fever for ≥ 5 days, those with positive blood culture for *S. typhi* and/or Widal agglutination test 1:160 or more dilution for O and/or H antigen. Children suffering from other systemic illness like congenital heart disease, tuberculosis, malignancy, terminal stage of any disease or protein energy malnutrition (PEM > Grade 3 as per Indian Academy of Pediatrics classification) [8] or whose guardians refused to give consent were excluded from the study.

After obtaining ethical approval from Institutional Review Board (IRB) of SKMCH, Muzaffarpur Bihar, India and a written consent was taken from parent/guardian of the subject. Detailed history and physical examination for fever, hepatomegaly, splenomegaly, bradycardia, anemia etc. was done according to a pre-designed proforma. Socioeconomic status was graded according to modified Kuppuswamy's scale. [9]

All patients included in this study underwent complete blood investigation to

estimate the total and differential leukocyte count, hemoglobin level and serum transaminases (ALT, AST) by using fully automated complete analyzer, Nihon Kohden Ceitac E. Widal test was done by using semi-quantitative tube agglutination (titration) method in patient with history of fever of >7 days duration. The titre of the patient was taken as the highest dilution of the serum sample that gave a visible agglutination. Titre of 1:160 or more dilution for O and/or H antigen was considered positive.

All the variables regarding the clinical symptoms, signs and the results of laboratory investigations were recorded and analyzed using SPSS version 17. The findings were tabulated in percentage and mean±standard deviation (SD) was calculated. The statistical analysis using Chi-square was carried out and a p-value <0.05 was considered statistically significant.

Results

Table 1: Distribution of patients according to age and gender

Age group (years)	Gender				Total (n=100)	
	Female (n= 40)		Male (n= 60)			
	No.	%	No.	%	No.	%
Infants	2	5	4	6.66	6	6
1-5	6	15	20	33.34	26	26
5-15	32	83.9	36	60	68	68

Most of the patients were in the age group of 5-15 years (68%) followed by 1-5 years (26%).

Table 2: Distribution of clinical symptoms and signs according to age

Signs and symptoms	Infants	1-5 years	5-15 years	P-value
Pain abdomen	--	6	22	0.1
Headache	--	4	42	0.000
Vomiting	2	14	17	0.1
Constipation	--	5	16	0.3
Diarrhea	4	15	5	0.000
Cough	--	7	8	0.2
Anorexia	--	14	42	0.006
Rose spot	--	--	--	--
Sick looking	4	15	35	0.2
Restless	2	6	10	0.8
Irritable	4	18	8	0.000
Coated tongue	--	--	8	0.3
Abdominal distension	2	15	35	0.1
Abdominal tenderness	--	8	23	0.4
Splenomegaly	4	10	30	0.3
Hepatomegaly	1	12	28	0.7
Icterus	--	3	10	0.4
Cyanosis	0	4	2	0.2
Pallor	0	7	16	0.5

The signs and symptoms of typhoid fever were analyzed according to age. Headache, anorexia and irritability were statistically significant symptoms for typhoid fever (p<0.05). The most frequently observed

signs were abdominal distention, splenomegaly and hepatomegaly. Coated tongue was found only in the age group 5-15. Rose spots were not observed in any of the cases. On the analysis of the signs

according to age, there were no significant differences in the frequency of any signs in the three age groups.

Table 3: Distribution of clinical symptoms and signs according to gender

Signs and symptoms	Male (n= 60)		Female (n= 40)		P-value
	No.	%	No.	%	
Pain abdomen	18	30	16	40	0.2
Headache	32	53.34	26	65	0.2
Vomiting	24	40	16	40	0.4
Constipation	14	23.34	10	25	0.6
Diarrhea	18	30	6	15	0.2
Cough	8	13.34	8	20	0.5
Anorexia	40	66.66	30	75	0.5
Sick looking	40	66.66	28	70	0.6
Restless	15	25	4	10	0.2
Irritable	28	46.66	8	20	0.2
Coated tongue	2	3.34	6	15	0.1
Abdominal distension	32	53.34	24	80	0.01*
Splenomegaly	32	53.34	22	55	0.9
Hepatomegaly	28	46.66	24	60	0.4
Icterus	6	10	8	20	0.4
Cyanosis	2	3.34	1	2.5	0.8
Pallor	20	33.34	6	15	0.1

Most of the symptoms were similar in both sexes. Almost all the signs and symptoms were more common in males as compared to females. Abdominal distention was significantly more in females as compared to males with a p-value of 0.01.

Table 4: Distribution of relative bradycardia in different age group and frequency of anemia

Relative bradycardia	Age		
	Infants	1-5 Years	5-15 Years
Present	--	--	5
Absent	4	22	49
Total	4	22	54
Anemia	Frequency	Percent	Hemoglobin (gm/dl)
Present	55	55	Mean SD
Absent	45	45	10.5 1.7

Relative bradycardia was present in 4 cases in the age group 5-15 and absent in other age groups. Anemia was found in 55 (55%) patients. Mean hemoglobin percentage of all cases involved in the study was 10.5% with SD of 1.7.

Table 5: Differential leukocyte count in different age group

Age group (years)	Mean neutrophil	Mean eosinophil	Mean basophil	Mean monocyte	Mean lymphocyte
Infants	62.4	2	--	0.2	28
1 to 5 years	63.7	0.7	0.2	0.8	34.6
5 to 15 years	66.4	1.7	0.1	0.8	32.4

The above table depicted differential leukocyte count in different age groups.

Discussion

Typhoid fever is an infectious disease caused by gram negative bacteria *Salmonella enteric serovar typhi* (S.typhi). In developed countries, the incidence of typhoid fever is less than 15 cases per 100,000 populations, with most cases occurring in travelers; whereas in developing countries the estimated incidence rate ranging from 100-1,000 cases per 100,000 populations. [6] It is endemic in developing countries where water supplies and sanitation are sub-standard. Humans are the only natural reservoir of the organism. Direct or indirect contact with an infected person is a prerequisite for infection. The infected person sheds the bacteria in stool and urine. Ingestion of food or water contaminated with *S. typhi* from human feces is the most common mode of transmission. [11]

Most of the patients were in the age group of 5-15 years (68%) followed by 1-5 years (26%). In present study, male predominance was seen. Similar results were reported in other studies. [12-15] The signs and symptoms of typhoid fever were analyzed according to age. Headache, anorexia and irritability were statistically significant symptoms for typhoid fever ($p < 0.05$). This was similar to studies conducted by Raj C [16], Chandrashekhar et al [17] and Gosai et al [18]. In this study, headache was significantly more common in age group of 5-15 years seen in 40 (54.1%) patients which is comparable to studies conducted by Lefebvre et al [19], Joshi BG et al [20] and Khan et al. [21] The most frequently observed signs were abdominal distention, splenomegaly and hepatomegaly. Coated tongue was found only in the age group 5-15. Rose spots were not observed in any of the cases. On the analysis of the signs according to age, there were no significant differences in the frequency of any signs in

the three age groups. Anemia was found in 55 (55%) patients. Mean hemoglobin percentage of all cases involved in the study was 10.5% with SD of 1.7. Most of the studies observed more leucopenia than leucocytosis. [18,20]

In the under two-year age group, the incidence of 10.7% highlights the importance of early immunization required for prevention of the disease and also supports the findings by Monorama et al. and Saha et al. [22,23] Another study from Dhaka, Bangladesh by Hyder et al. was done exclusively on children under two years. They detected 40 cases in a span of 10 months despite popular belief that enteric fever is a rarity in this age group. [24] Relative bradycardia was present in 4 cases in the age group 5-15 and absent in other age groups. The study conducted by Ganesh et al [25] showed relative bradycardia in 15.2% cases seen mainly in children more than 5 years of age, which rightly correlates with the present study. In the present study, leucopenia was not observed which could be due to the fact that almost all the patients who presented to us had taken antibiotics for few days of.

Conclusion

Typhoid fever is still a serious public health concern that mostly affects school-age children. Public health measures include the provision of clean water for drinking, proper sanitation, education on the illness and how it spreads, and excellent hygiene habits may be used. Proper hand washing practises should be taught to food workers, especially in hotels, hostels, and public schools. Moreover, typhoid vaccination and prudent antibiotic administration based on the sensitivity pattern will aid in lowering the illness burden.

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